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CHICAGO 16, ILLINOIS

GAS ABSTRACTS

JUNE, 1954

VOLUME 10, NUMBER 6

AFFILIATED WITH

ILLINOIS INSTITUTE OF TECHNOLOGY

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GAS ABSTRACTS is published and distributed monthly by the Institute of Gas Technology, Chicago 16, Illinois. The contents of selected papers and patents are reviewed impartially by the editorial staff and material of potential interest to the Gas Industry is presented. Subscription rates to non-members of the Institute: $18.00 per year to U.S. addresses; $22.00 foreign.—Printed in the U.S.A.

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1. GAS INDUSTRY

Depreciation Accounting

Griffith, F. L. PROPERTY EXHAUSTION COSTS. *Public Utilities Fortn.*, 53, 333-36 (1954) March 18.

This article deals, as have many in recent years, with the problem of stating the depreciation of plant investment in terms of current dollar values and its effect on public utility regulation. The author believes it is necessary for a company to reflect in its rates the effect of the change in the value of the dollar, both in times of inflation and depression.

H. C. Owen

Engineer Executives

Eldridge, W. C. EXECUTIVE DEVELOPMENT OF ENGINEERS. *Petroleum Eng.*, 26, E4-13 (1954) April.

A general discussion of executive training for engineers. The author points to the fact that management ranks are hopelessly understaffed and engineers are the logical choice for replacement. Engineer training should be directed toward the goal of eventual administration positions. W. G. Bair

Mechanized Information

MACHINE AGE IN THE LIBRARY. *Chem. Week* 74, 74-76 (1954) March 13.

Suggestions are given for any industry that is considering setting up a literature machine-searching system. C. A. Simms

Production Tax

SENATE BOOSTS GAS TAX. *Oil Gas J.*, 52, 95 (1954) April 12.

A part of the trends toward higher gas costs at the wellhead, the action of the Texas senate in boosting the production tax on natural gas in Texas from the present 5.72 percent to 9 per cent of market value is significant. This article reports the above in somewhat greater detail and indicates other activities in the Texas legislature concerned with the same topic.

R. F. Bukacek

Reserves

Logan, L. J. ESTIMATED U. S. AND CANADIAN RESERVES REACH NEW HIGHS. *World Oil*, 138, 48-50 (1954) April.

U. S. proved recoverable reserves of natural gas were estimated at 211,447 billion CF at the end of 1953, an increase of 11.73 billion over 1952. Production during 1953 totalled 9,239 billion CF. Proved recoverable reserves of natural gas liquids increased 441 million bbl to a new total of 5,438 million bbl at end of 1953, and production was 302.7 million bbl as compared to 284.8 million in 1952. Proved reserves of crude petroleum were 28,945 million bbl at end of 1953, an increase of 984 million over 1952. Canadian reserves at end of 1953 stand at 1,845 million bbl crude oil and 198 million bbl natural gas liquids, as compared with 1,680 million and 65 million bbl, respectively in 1952. (See also *World Petroleum*, 25, 84 (1954) April) O. P. Brysch

NATURAL GAS RESERVES AT ALL-TIME HIGH. *Gas Age*, 113, 33-35 (1954) April 8; *AGA Monthly*, 36, 4-7, 52, 53 (1954) April.

Proved recoverable natural gas reserves in the United States at the end of 1953, totaled 211.4 trillion cubic feet, an increase of 11.7 trillion cubic feet over the previous year. Each year oil, natural gas, and natural gas liquid reserves increase showing that new supplies are being discovered more rapidly than the known reserves are being used. Last year 302,698 bbls. of natural gas liquids were produced while proved reserves increased 441,271 bbl. to a total of 5,437,922 bbl. Tables give a state-by-state breakdown of the production and changes in reserves last year and summaries of the estimates from 1946 to date. R. T. Ellington

2. APPLIANCES

Burners

Blaha, E. (assigned to Selas Corp. of America) CERAMIC DISTRIBUTOR FOR RADIANT GAS BURNERS. U. S. 2,669,300 (1954) February 16.

Marble, H. A. (assigned to International Sales Co.) SHEET METAL FUEL GAS BURNER

CONSTRUCTION. U. S. 2,670,790 (1954) March 2.

Thompson, H. E. AIR COMPENSATOR FOR GAS BURNERS. U. S. 2,670,034 (1954) February 23.

Cookers

Reeves, H. M. (assigned to Florence Stove Co.) STOVE CONSTRUCTION. U. S. 2,675,797 (1954) April 20.

Controls and Ignition

Basci, J. SAFETY CONTROL DEVICE FOR HEATING BURNERS. U. S. 2,669,298 (1954) February 16.

Burchett, R. L. (assigned to Ronson Art Metal Works, Inc.) GAS LIGHTER VALVE. U. S. 2,672,038 (1954) March 16.

Cassidy, R. J. (assigned to General Motors Corp.) BURNER SAFETY CONTROL SYSTEM. U. S. 2,672,188 (1954) March 16.

Chambers, J. E. (assigned to Chambers Corp.) IGNITION DEVICE FOR GAS BURNERS. U. S. 2,670,791 (1954) March 2.

Gollus, L. R., Hay, W. W., Milton, J. M. and Turner, V. A. GAS FUELED PILOT BURNER TIP OR HEAD. U. S. 2,675,068 (1954) April 13.

McCabe, I. E. FUEL BURNER INTERLOCKING SAFETY CONTROL. U. S. 2,671,502 (1954) March 9.

Outterson, G. G. SAFETY CONTROL FOR A COMBUSTION SYSTEM. U. S. 2,673,603 (1954) March 30.

Shottenfeld, R. (assigned to Ensign Ribbon Burners, Inc.) SAFETY CONTROL SYSTEM FOR GAS BURNERS. U. S. 2,675,069 (1954) April 13.

Wittman, R. A. SAFETY CONTROL SYSTEM FOR GAS BURNERS EMPLOYING SINGLE POINT IGNITION. U. S. 2,670,035 (1954) February 23.

Gas vs. Oil Heat

NATURAL GAS EXPANSION STRIKES HEART OF HEATING OIL MARKETS. *Nat. Petroleum News*, **46**, 20-22, 24, 25, 27, 28 (1954) March 3.

Only yesterday a "poor relation" of the oil industry, natural gas has sprouted up overnight to become the nation's sixth largest industry. Some 1,221,000 new gas home-heating customers are expected to be added in the 1953-54 heating season. Further expansion is indicated by current applications for 10,000 miles of new gas lines to feed new and existing markets, mostly in the north. The heating oil marketer generally is seen as being slow to awaken to the natural gas threat. But local jobbers, jobber groups and heating oil organizations are striking back with aggressive campaigns.

Editorial Abstract

Potential Sales

BY '58-59 MILLION APPLIANCE SALES? *Amer. Gas Assoc. Monthly*, **36**, 11-12 (1954) April.

The AGA Bureau of Statistics estimates that a potential of 59 million range, water heater, and heating unit sales can be made in the interval 1954-58. This estimate is based on the assumption of continuance of current levels of economic conditions and increases in promotion and product design activity. At current economic levels it is estimated 19,300,000 ranges, 18,000,000 water heaters, 7,800,000 central heating units and 13,700,000 space heaters can be sold in this time interval with an annual potential of about 225,000 driers, and 200,000 incinerators. Examination of this survey should be important to both manufacturers and utilities in facilitating the development of management plans.

R. T. Ellington

Refrigerator

Kögel, W. G. (assigned to Aktiebolaget Elektrolux, Sweden) ABSORPTION REFRIGERATION. U. S. 2,672,737 (1954) March 23.

Regulator

Kern, F., Jr. (assigned to Maxitrol Co.) GAS REGULATOR. U. S. 2,668,396 (1954) February 9.

Space Heater

Jones, D. F. (assigned to Motor Wheel Corp.) BURNER MOUNTING IN A GAS HEATER. U. S. 2,671,500 (1954) March 9.

3. COMBUSTION AND INDUSTRIAL FURNACES

Boiler Efficiency

Kaiser, E. R. FRONTIERS IN HEAT EXTRACTION FROM THE COMBUSTION GASES OF COAL. *Mining Eng.* (Trans. ASME) 6, 304-13 (1954) March.

Even slight gains in efficiency, economy and labor saving become very significant when multiplied by the enormous quantity of fuel consumed in steam generation. Factors important to efficiency are discussed in groups,— 1) combustion, temperatures and rates, 2) radiation and boiler shape, 3) ash and slag deposits, 4) corrosion, 5) limits of coal cleaning and boiler size. It is concluded that solution of ash and sulfur problems is more promising through improved boiler design than through supercleaning of coals. O. P. Brysch

Coal Combustion

Veron, M. (assigned to The Babcock & Wilcox Co.) COMBUSTION CHAMBER FOR AIRBORNE SOLID FUELS. U. S. 2,672,012 (1954) March 16.

A pulverized coal combustion apparatus is described for generating gases for use in gas turbines. E. J. Pyrcioch

Flame-Failure Controls

Perl, I. M. PROGRESS REPORT ON FLAME-FAILURE CONTROL. *Ind. Gas* (British) 17, 132, 134-136, 139-140 (1954) February; 17, 182, 184, 186-188 (1954) March.

The English Board of Trade, on account of exchange considerations, was obliged to prohibit importation of flame-failure controls from the U. S. This article by the Managing Director of Perl Controls, Ltd., describes the development of controls to fill the void resulting from cessation of imports. The British thinking closely follows our own on the matter of controls in that Baso-type thermo-electric valves are used for low input burners and electronic controls for large burners, high combustion chamber temperatures, and fast response. The thermo-electric valves are of both the standing pilot and complete shut-off types. The second article of the series continues the discussion of British controls by first taking up the use of thermo-electric valves in the bleed lines of diaphragm valves controlling larger burners and the inherent dangers. The valve most used with electronic controls is one employing a solenoid in the bleed line of a diaphragm valve similar to the G. C. B-55, or H.M. V-495. The electronic controls themselves were not discussed.

R. T. Ellington

Gas Turbine Problems

Biert, J. and Scheidegger, R. SLAG DEPOSITION AND CORROSION IN GAS-TURBINE PLANTS. *Eng. Digest*, 15, 97-100 (1954) March.

A presentation is made of the difficulties encountered in high temperature gas-turbine plant operation due to slag deposition and corrosion resulting from mineral constituents in fuel oils. Suggestions for reducing slag deposition include: conversion of vanadium into compounds with a high melting point; volatilization of vanadium; and use of surface-protecting layers. The mechanism of metal corrosion is reviewed along with a discussion of the corrosive effect of sulfur compounds and liquid slags (sulphates, vanadium oxides and vandates) on steel. E. J. Pyrcioch

Industrial Gas Burners

Hanson, H. M. and Funk, E. J., Jr. (assigned to The C. M. Kemp Manufacturing Co.) GAS FUELED SINGEING BURNER. U. S. 2,675,067 (1954) April 13.

MacFarlane, J. L. (assigned to The Mac Mixer, Inc.) FUEL AND AIR MIXING UNIT FOR BURNER ASSEMBLIES. U. S. 2,670,788 (1954) March 2.

Morck, C. W., Jr. (assigned to Selas Corp. of America) RADIANT GAS BURNER. U. S. 2,671,507 (1954) March 9.

Inert Atmospheres

Lanning, E. S., Jr. CONTROLLED ATMOSPHERES FOR HEAT TREATMENT OF METALS: METHODS AND EQUIPMENT. *Ind. Gas*, 32, 3-6 (1954) March.

A comprehensive discussion of atmospheres required for copper, nickel, aluminum, magne-

sium, precious metals, steel and some of their alloys. J. G. Chalcraft

Smog Problem

Breese, F. REFINERIES AREN'T TOP SMOG MAKERS. *Petroleum Processing*, 9, 515-19 (1954) April.

The oil industry in southern California is vigorously defending itself against charges of being the chief contributor to Los Angeles smog. The Smoke and Fumes Committee of the Western Oil and Gas Assn. was formed to campaign against indiscriminate criticism and restrictive laws by a program of active research and public education. Of the 1325 tons (0.1325%) of hydrocarbons found in local polluted air, refineries contribute 315 tons, as compared 160 tons evaporation and 850 tons in exhausts of automobiles. Elimination of 80% (est.) of the refinery SO_2 emissions has not prevented increase in smog. Installation of floating roofs on larger products storage tanks is well advanced. To date corrective equipment has cost $15 million, and research $1.5 million. Among other active groups an independent Southern California Air Pollution Foundation, founded by business, banking and educational leaders and directed by Dr. L. B. Hitchcock, was organized in 1953 to study this long range problem. O. P. Brysch

Chappellet, F. "SMOG". *Nat. Petroleum News*, 46, 18-21 (1954) March 24.

The oil industry answered the attack leveled against smog as the offender in the Los Angeles area. The bases of the industry's defense were set forth by two points: 1) hydrocarbon constitute a small portion of local air pollution. 2) the industry's share of hydrocarbon is very small. The industry's position can be summed up as follows: 1) it admits to being a contributor but believes the blame has been exaggerated. It will cooperate with serious efforts to solve the problem by supplying men and money. 2) it is willing to comply with any order or regulation issued by government agencies because resistance evokes unfavorable publicity. It hopes future regulations will be based on a comprehensive scientific study rather than untested theories. 3) its responsibility for the elimination of smog reaches only by the extent to which it contributes. 4) it is disposed to defend itself against accusations the technicians consider untrue. H. A. Dirksen

Waste Heat Recovery

Campbell, O. F. and Pennels, N. E. CO BOILER AND STEAM SUPERHEATER IMPROVE FLUID CAT EFFICIENCY. *World Petroleum*, 25, 68-71, 90 (1954) April; CO BOILER, FLUIDIZED-BED STEAM SUPERHEATER FEATURE SINCLAIR F. C. C. PLANT. *Oil Gas J.*, 52, 132-136, 176-181 (1954) February 22; *Chem. Eng.*, 61, 114-116, 118 (1954) April.

The article describes a CO boiler and re-spray fluidized bed steam superheater used in fluid catalytic cracking operations. Approximately 400,000 lb. per hour of 550-psig 750°F.—total temperature steam production is a unique feature of the installation. Over 300,000,000 lb. per hour of 700 psig saturated steam is produced on the industry's first direct-fired unit to recover both the sensible heat and the heat of combustion from the high-temperature catalyst regenerator flue gas. The heat of combustion of the regenerator exit flue gas is derived from its 5 percent CO content. J. G. Chalcraft

German, W. L. WASTE HEAT UTILIZATION. *Fuel Economist*, (British) 2, 140-143 (1954) March.

Since the war fuel costs have risen tremendously and British industry has been faced with the necessity of obtaining the utmost in thermal efficiency in industrial processes as will our industry if present trends continue. This article deals mainly with kiln firing and compares heat savings in various types of combustion heated kilns with the very high efficiency in one electric kiln. Various recuperative systems and continuous kilns are described, but of greatest interest should be the Minter system of economizing in round, down-draft, intermittent kilns. The flues of all kilns in the yard are interconnected and fed to one exhaust fan or stack so that air pulled through a cooling kiln can be used to watersmoke another and the stack gases from a firing kiln are used to preheat a fourth. Fuel savings of about 25% are obtained. R. T. Ellington

4. CARBONIZATION AND GASIFICATION

Ammonia Saturator

Ackeren, J. Van (assigned to Koppers Co., Inc.) AMMONIUM SULFATE CRYSTAL PRODUCING APPARATUS. U. S. 2,671,011 (1954) March 2.

An improved, low back-pressure saturator for removal of ammonia from gases is described. Gas enters an annular chamber, moves around it while being sprayed with re-circulated acid-liquor and rises into a cyclone type outlet channel through the inner annulus wall, whence it moves radially to a central outlet riser. The whole of the gas chamber system is sealed by the acid bath, the precipitating crystals being directed by a conical bottom toward a lower settling pocket, for gas-lift recovery.

O. P. Brysch

Coal Pipe Line

Jones, S. A. and Reichl, E. H. (assigned to Pittsburgh Consolidated Coal Co.) TRANSPORTATION OF SOLIDS THROUGH PIPE LINES. U. S. 2,672,370; 2,672,371; 2,672,372 (1954) March 16.

The patents relate to the design of pumping stations for the transportation of coal slurries over distances of 100 miles or more.

G. V. Vosseller

Coking Research

Townend, D. T. A. THE SECOND HODSMAN MEMORIAL LECTURE. SCIENCE AND COAL. *Gas J.* (British) 277, 593-597, 599, 602 (1954) March 10; *Gas World* (British) 139, 726-28, March 13; 790-93, 796 (1954) March 20.

Characterizing Hodsman as one of the early proponents of applied science, the author discusses his contributions in the study of the chemical nature of coal. His studies of pyrolysis and of coke residues, classed with those of Wheeler, represented the chemical approach, just as Stope's work was the geological, and Bangham's and Dryden's the physical approach. These all aided in the new conceptions of combustion of solid fuels, and of coke, which are being extended today. O. P. Brysch

Coke Testing

Ward, D. H. THE SAMPLING AND DETERMINATION OF MOISTURE OF COKE. *Gas World* (British) 139 Suppl., 55-58, 60 (1954) March 6.

Four years of study by the Joint Coke Consultative Committee (of the coking and the iron industry) on the problems of sampling and moisture determination of coke are summarized, and the statistical bases for the reliability of the methods is explained. The method agreed upon by both producer and consumer requires 12 increments from each 6 cars as a sub-sample. These were checked by studies of size of increment, location of increment in car, and comparison with complete section increments from a stopped belt. Good agreement has been obtained between results of most producers and consumers, with confidence limits of 95 times out of 100. Detailed statistical study of sub-sample results of both has been helpful in validating the methods and establishing the accuracy of the results. O. P. Brysch

Dust Removal

Kane, L. J., Wainwright, H. W., Shale, C. C. and Sands, A. E. DETERMINATION OF SOLID AND LIQUID IMPURITIES IN SYNTHESIS GAS. U. S. Bur. Mines Rep. Invest. 5045 (1954) March.

This is an excellent introduction to a difficult problem. Line diagrams are presented of laboratory and pilot equipment for obtaining representative samples of dust particles in synthesis gas and of equipment for determining both the dust and moisture contents of the sample. Both sampling and analytical (dust particle size and size consist) techniques are discussed with multiple pertinent references. Typical dust dispersions (synthetic gas from coal at atmospheric, and at pressure up to 100 psig) are illustrated. E. S. Pettyjohn

Gasification Processes

Mattox, W. J. (assigned to Standard Oil Development Co.) GASIFICATION OF CARBONACEOUS SOLIDS. U. S. 2,672,410 (1954) March 16.

The use of metal halides, particularly sodium chloride, mixed with solid fuel, is recommended

for suppressing carbon dioxide formation in water-gas generation. C. G. von Fredersdorff

Morley, R. J. (assigned to Imperial Chemical Industries Limited) GASIFICATION OF CARBONACEOUS MATERIALS. U. S. 2,671,015 (1954) March 2.

This patent proposes a system of fluidized carbonization and gasification in separate vessels whereby heat recovery is achieved by contacting the hot gaseous products in continuously operating pebble heaters which preheat the incoming gasifying medium.

C. G. von Fredersdorff

Watson, C. W. (assigned to The Texas Co.) METHOD FOR PRODUCING A SYNTHESIS GAS. U. S. 2,671,013, 2,671,014 (1954) March 2.

The present patents contemplate the preparation of synthesis gas from a carbonaceous feed material containing hydrogen, by reaction with a carbidable and subsequently decarbidable metal at elevated temperatures (above 1000° F.) at which decomposition takes place to liberate free hydrogen and form a carbide of the metal. Reduction of the metal carbide by carbon dioxide to the decarbided form yields a stream of carbon monoxide in excess of the carbon dioxide used. Cobalt is the prefered metal, and 100-300 psig the preferred pressure range. Modification of the above permits continuous production. H. A. Dirksen

DU PONT TRIES NEW ROUTE TO SYNTHESIS GAS. *Chem. Eng.*, 61, 114-116 (1954) March.

The production of synthesis gas for ammonia synthesis and other chemical purposes has been under investigation in a relatively new process employing partial combustion of pulverized coal in the presence of oxygen and steam. Several experimental gasifiers operating at atmospheric pressure and ash slagging conditions were tested at coal rates of 500 and 3000 lb/hr.

C. G. von Fredersdorff

Gas Purification

Gollmar, H. A. (assigned to Koppers Co.) SEPARATION OF ACID GASES FROM COAL CARBONIZATION GASES. U. S. 2,671,008 (1954) March 2.

An improved method of separating acid gases from the vapors released in the hot-vacuum-actification process of gas purification is described. Vaporized solvent oil is used to prevent precipitation of compounds such as naphthalene in condensers, and countercurrent scrubbing of the vapors with water removes ammonia.

C. E. Hummel

Jahnig, C. E. and Gornowski, E. J. (assigned to Standard Oil Development Co.) SYNTHESIS GAS DESULFURIZATION. U. S. 2,671,723 (1954) March 9.

Synthesis gas produced by partial oxidation of finely divided coal is desulfurized by cooling, adding a small amount of air, and contacting in a fluid bed with the spent char from the gasification step, at a temperature between 400 and 1000° F. Sulfur in the gas is largely converted to the elemental form and is deposited on the char, which is separated from the gas and utilized for recovery of sulfur or in other ways. The gas is oil-scrubbed to remove traces of entrained fines and any tarry material; last traces of sulfur may be removed by any conventional process, such as "luxmasse". In a plant producing 350 MMSCF per day of $CO+H_2$, and with the raw gas containing 58 tons per day of sulfur, it is estimated that the gas can be substantially freed of sulfur by this process for an investment of $1,000,000, compared to an investment of $4,000,000 for conventional amino-alcohol absorbers, or an investment of $2,000,000 using regular activated chars. D. M. Mason

Sweetser, S. B. and Mueller, R. H. (assigned to Standard Oil Development Co.) SYNTHESIS GAS DESULFURIZATION. U. S. 2,671,722 (1954) March 9.

In a fluidized process for production of synthesis gas from coal, coke, etc., gasification is conducted in two stages such that the coke or char withdrawn from the first stage has a surface area of at least 350 sq. meters per gm. All or part of this high-surface-area char is cooled and contacted with the synthesis gas mixed with 1-2% of air in a fluidized bed at 75-400° F. H_2S is oxidized to sulfur, and organic sulfur

compounds are adsorbed in the char. Small amounts of residual sulfur compounds in the synthesis gas are removed by conventional means. The char containing the deposited or adsorbed sulfur is withdrawn from the reactor and conveyed to another fluidized bed where all the sulfur and only a minimum amount of carbon are burned off. The desulfurized char is conveyed to the 2nd stage of gasification for conversion to synthesis gas. D. M. Mason

Methane Recovery

Minchin, L. T. PROGRESS REVIEW NO. 30: THE EXTRACTION AND UTILIZATION OF FIREDAMP. *J. Inst. Fuel* (British), 27, 148-153 (1954) March.

Firedamp (chiefly methane) is extracted from coal mines in England and on the European content. The usual practice is to drill into the rock structure around a coal seam being produced, and to collect the gases released by the fracturing of the coal during the mining operation. Present chief use for the gases so released is underfiring steam boilers. Attempts are being made to coordinate further the production and distribution for industrial sales, which are now practised by Distrigaz in Belgium. W. G. Bair

Regenerator Flow Control

Otto, C. REGENERATOR FLOW DISTRIBUTION CONTROL. U. S. 2,672,437 (1954) March 16.

In any type of vertically-flued coke oven battery, an improved heat distribution is claimed by reason of modified ports between the sole-flue and the regenerator chamber. These ports are formed in a refractory shape, to open vertically into the regenerator, as usual, but the port passages are turned 90 degrees to open transversely into the sole-flue. The sole-flue face of the opening is partially covered by a flap-plate or damper graduated to permit proper amounts of fuel gas (or air) to enter the generator when the flap is down under the influx differential pressure, but the flap is swung open upon reversal to enable an increased flow of waste gases from the regenerator to the sole flue. O. P. Brysch

Sweep-Gas Coking

Nicklin, T. and Redman, M. ACCELERATED CONTINUOUS CARBONISATION: THE "ROCHDALE" PROCESS. *Gas J.* (British) 277, 665-686 (1954) March 17; 278, 45-6, April 7; 106, (1954) April 14; *Gas World* (British) 139, 784-87, March 20; 854-58, March 27; 924-27, April 3; 998-1004 (1954) April 10; *Gas Times* (British) 78, 358, 359, 362-64, 369 (1954) March 19; 79, 87-9 (1954) April 16.

A reduction in coal gas production costs in Great Britain may be possible by incorporating results obtained in recent tests on accelerated continuous carbonization in vertical retorts, designated as the Rochdale process. Pilot scale tests on this process, using Glover-West and Woodall-Duckham retorts, were conducted at approximately twice the normal coal throughput rates without producing adverse effects on gas, tar and coke quality. The increase in carbonization capacity was achieved by eliminating steam injection at the bottom of the retort and substituting an inert medium such as blue gas to improve the heat transfer characteristics of the fuel bed. The effect of this increased productivity is examined in relation to production costs, capital investment, size and quality of coal, coke quality and plant flexibility.

C. G. von Fredersdorff

5. NATURAL GAS AND NATURAL GAS CONDENSATES

Carbon Black

Sperberg, L. R. (assigned to Phillips Petroleum Co.) TREATMENT FOR REDUCING THE pH OF FURNACE BLACKS. U. S. 2,657,117 (1953) October 27.

Treatment of carbon blacks with an inorganic acid at the proper stage of manufacture will lower the pH of the black and will according to this claim, increase the scorch time of a furnace black when incorporated in rubbers.

D. V. Kniebes

Exploration Costs

Struth, H. J. EXPLORATION COSTS EIGHT TO ONE OVER PRE-WAR LEVEL. *World Petroleum*, 25, 66-68 (1954) March.

The depth of drilling is the predominent factor

in the oil industry's constantly rising cost of exploration. The author shows that due to this phenomenal rise in cost of exploration and drilling, depletion allowance of 27½ percent is not sufficient. D. C. Gami

Flow Measurement

Lindahl, E. J. PULSATION EFFECTS ON GAS MEASUREMENT. *Gas Age*, 113, 38-30, 66, 67 (1954) March 25; *Amer. Gas J.*, 180 14, 15, 34 (1954) March.

A description of the effect of pulsation on gas measurement, its importance, the available methods of pulsation dampening and the state of our knowledge of the fundamentals of the problem. R. F. Bukacek

Gas Drilling

Owen, R. GAS DRILLING IN THE SAN JUAN BASIN. *World Oil*, 138, 107-111 (1954) February 1.

The development of the technique of using natural gas as a circulating medium with rotary equipment has put well completions on an efficient and economical basis where conventional methods have proven unsatisfactory. With rotary tools using fluid circulation, trouble was encountered due to endless lost circulation which caused an expense in excess of $20,000 per well for drilling mud and chemicals. Drilling water was an important cost consideration because it had to be hauled by tank trucks. When cable tools were used to drill-in, shoot and clean out the well could be completed and put on production but frequent fishing jobs caused the completion phases to be costly. Using natural gas, the average cost of mud and chemicals has been reduced to $1,500.00 per well, although normal drilling will require about 2000 MCF/d at a pressure of 400 to 600 psig. In the event a wet hole is encountered, a volume of 3000 to 4000 MCF/d. is desirable. When drilling with gas, it is not possible to obtain the usual formation samples desired for geological examination. Estimated total depths are calculated and correlated with drilling time and electric log in arriving at the completion depth for any given well. H. C. Owen

Gas-Oil Ratios

Cook, A. B., Spencer, G. B., Bobrowski, F. P. and Chin, T. CHANGES IN GAS-OIL RATIOS WITH VARIATIONS IN SEPARATOR PRESSURES AND TEMPERATURES. *Petroleum Eng.*, 26, B77, 78, 80, 82 (1954) March.

Experimental studies in the field and the laboratory on the effect of temperature and pressure on the producing gas-oil ratio of a well were performed. Reservoir fluid samples were flash-liberated in PVT equipment at various temperatures and pressures, simulating the operation of field separators. The results indicated that there is an optimum pressure to operate the separators for a well that will result in the highest API gravity stock-tank oil and the lowest gas-oil ratio. This can be predicted from flash liberation tests in the laboratory on bottom-hole samples. B. E. Eakin

Liquefied Natural Gas

Parker, P. S. and Ormston, R. H. LIQUEFACTION BEHIND THE IRON CURTAIN. *Gas Age*, 113, 29-32 (1954) March 11.

A plant designed to liquefy 4½ MMCF per day of natural gas, containing 3% N_2 is described. External refrigeration using ethylene and ammonia cycles lowers the temperature to -125° F. causing partial condensation. Additional temperature drop is obtained by expanding the liquid-vapor mixture in a flash tank. Total combined storage capacity of 162,000,000 SCF of natural gas in liquid state is provided.

D. C. Gami

Paris-Lorraine Pipe Line

Wallis, W. GAZ DE FRANCE COMPLETES 220-MILE LINE. *Petroleum Eng.*, 26, D31-32 (1954) March.

A 220-mile gas line, which will transport gas manufactured in coke ovens, blast furnaces, and mines of the Lorraine region of eastern France to the south Paris area, is nearly complete; but operation of the line awaits the installation of compressors. Methods and equipment for the line are American. Approximately 35,000,000 cu. ft. per day will be transported in 12-in. pipe. This is of grade 37 steel and a wall thickness of 5/16 in. The pipe is primed, coated with carbolac, and wrapped with glass fiber. The gas

will be purified using the following processes: desulfurization with iron oxide, treatment with potassium carbonate, and naphthalene and water removal by refrigeration. Total power needed for the line is nearly 90,000,000 kw. Operators of the line will have a private dial telephone line for communication to all points. H. C. Owen

Pulsation Dampening

Taylor, C. N. HOW TO STOP TROUBLESOME PULSATION WITHOUT EXCESS PRESSURE DROP. PART I. *Oil Gas J.*, 52, 101, 102, 105, 112 (1954) March 8.

A discussion on the design and performance of the series-type dampeners for reducing pressure pulsations at compressor stations without excess pressure loss. Acoustic theory is given. S. Hu

Taylor, C. N. HOW TO STOP TROUBLESOME PULSATION WITHOUT EXCESS PRESSURE DROP. PART II. *Oil Gas J.*, 52, 113, 114, 117, 150 (1954) March 15.

Equations are presented for the design of a series-type dampener for use on the suction and discharge lines of reciprocating compressors, and on other applications such as mufflers for engines or air-intake silencers. While they are technically correct, they do not represent the most advanced theory but have been found to give surprisingly good results. Dampeners based on this method are practical in design and are fully capable of giving a performance that leaves little to be desired. The resulting pressure drops are also smaller than with other dampener designs used at present in the industry. H. C. Owen

Rate Adjustments

Chapman, F. HEATING VALUE RATE ADJUSTMENTS. *Gas*, 30, 35-38 (1954) March.

The author says that at the present time more than 40% of the natural gas customers in the United States have a provision for heating value adjustments in their building structure. These provisions are either in the form of a straight therm rate or in the form of a Btu adjustment clause affecting the rate for a quantity of gas having a standard Btu content. A tabulation by states of the number of natural gas customers and the type of heating value adjustment, if any, is presented. Common patterns of the provision for heating value adjustment are also quoted. Some common problems of maintaining and measuring the heat content of the gas sent to customers are then discussed. H. C. Owen

Supply Systems

Kallina, C. T. INTERCONNECTED PIPELINE SYSTEMS. *Amer. Gas Assoc. Monthly*, 36, 4-6, 42, 43 (1954) March; *Amer. Gas J.*, 180, 21, 33 (1954) March.

The author discusses the desirability of interconnections between natural gas pipeline systems in a general way. These interconnections would be used to maintain service during interruption of flow on one line, to physically and economically maintain adequate supplies of gas from producing areas, to maintain high load factors, to reduce costs of construction and operation, to safeguard the national defense effort. H. C. Owen

TEXAS ILLINOIS ADDS 134 MMCF DAILY. *Gas Age*, 113, 39-41 (1954) March 11.

A description of Texas Illinois Natural Gas Pipeline Company's $33,000,000 expansion program. R. F. Bukacek

Utah Gas

Bernick, B. NATURAL GAS SEARCH BOOMS IN INTERMOUNTAIN WEST. *World Oil* 138, 66-68 (1954) March.

Utah, Western Colorado, and Southwestern Wyoming are experiencing a boom in the search for natural gas. El Paso Natural Gas Company has incorporated Utah Western Pipe Line Company for the purpose of carrying gas from this area to the California border, and the drive to find sufficient reserves to obtain transmission approval by state regulatory bodies and the Federal Power Commission is being accelerated. At least three trillion cubic feet of reserves will be needed to supply both Utah demands and minimum pipe line requirements of approximately 150 MMCF per day, and it is believed by some that these requirements will be proven in the near future. H. C. Owen

Underground Storage

Burke, W. F. and Clay, T. W. STORING GAS IN DEPLETED OIL FIELD. *Gas Age*, **113**, 44-47, 80, 82, 83, 86 (1954) March 11; *Gas*, **30**, 117-120 (1954) April.

The Lone Star Gas Co. is using the abandoned New York City field in Clay County, Texas, to store gas for winter peak supply to the Ft. Worth-Dallas markets. The net storage capacity has been calculated to be 4 billion cubic feet, when operating the reservoir between 3200 psi and 1000 psi. Oil produced will be recovered from the gas by a 2-stage separator system, and the gas recycled to the field or discharged into the line. No results on oil recovery are available, at present, but the pressure-volume history during gas injection has followed the predicted curve indicating the initial calculations to be correct. B. E. Eakin

Underground Storage, LPG

LION OIL CO.'S EXPERIENCE WITH UNDERGROUND STORAGE OF BUTANE, PROPANE, AND GASOLINE. *Oil Gas J.*, **52**, 78-81, 86 (1954) March 1.

The LP-gas underground storage facilities of the Lion Oil Company are described. These total 101,000 bbl. at present and are expected to be developed to 900,000 bbl. ultimate capacity. Details including plant equipment and operating experience are given. An economic analysis of the project is also presented showing actual investment and maintenance costs to date and expected future costs in relation to the realized increase in income derived from the stored off-season LPG. It is indicated that underground storage in this case has cost less than $1.00 per barrel compared with the anticipated $17.00 per barrel cost of conventional steel tank storage in the same area. J. M. Reid

6. PETROLEUM AND SYNTHETIC LIQUID FUELS

Arabian Crude Imports

WAFRA CRUDE: COMPETITOR OF TEXAS OIL. *Nat. Petroleum News*, **46**, 17 (1954) March 10.

"Poor quality" Wafra crude from the Wafra field in Kuwait Neutral Zone which is high in sulfur and low in gravity has been laid down in Houston, Texas. Educated guesses say the oil landed in Houston at about 20¢ to 25¢ below the cost of similar gravity sour oil from West Texas via pipeline. If a long-term contract to move Wafra oil to Houston has been closed, trade sources fear the effect on Southwestern crude and products markets. H. A. Dirksen

Desulfurization

Cope, A. C. and Farkas, E. CLEAVAGE OF CARBON-SULFUR BONDS BY CATALYTIC HYDROGENATION. *J. Org. Chem.*, **19**, 385-390 (1954) March.

Representative mercaptans and sulfides have been converted to hydrocarbons by catalytic hydrogenation in the presence of molybdenum trisulfide at 260°. Raney nickel desulfurization is known to yield similar products at much lower temperatures, but catalytic hydrogenolysis appears to be a useful procedure for sulfur compounds that are thermally stable at 260°. Other "sulfactive" catalysts were investigated less thoroughly than molybdenum trisulfide, but cobalt sulfide had similar activity in the cases studied. Mercaptans were hydrogenated but a sulfide was not with a commercial cobalt molybdate catalyst at 260°. Authors' Abstract

Porter, F. W., Northcott, R. P. and Rowland, J. (assigned to Anglo-Iranian Oil Co., Ltd.) CATALYTIC DESULFURIZATION OF PETROLEUM HYDROCARBONS. U. S. 2,672,433 (1954) March 16.

Anglo-Iranian's autofining process for catalytic hydrodesulfurization is described. A selected distillate fraction is treated in a first desulfurization zone under conditions such that sulfur compounds are hydrogenated in sufficient amount to yield the hydrogen required not only for this first zone of desulfurization but also for a second desulfurization zone in which heavier petroleum fedstocks, such as wax distillate, crude oil and reduced crude, are desulfurized. The preferred sulfur-resistant catalyst for the process is a cobalt molybdate type. D. M. Mason

Rosenwald, R. H. (assigned to Universal Oil Products Co.) TREATMENT OF HYDROCARBON DISTILLATES. U. S. 2,671,048 (1954) March 2.

Hydrocarbon distillates are sweetened by con-

tacting in the presence of air with a hydrocarbon-soluble organic basic compound selected from aliphatic polyamines, heterocyclic nitrogen compounds, and quaternary ammonium compounds. The sweetening process is accelerated and the product inhibited if N, N -disecondary-butyl-p-phenylene diamine is also added.

D. M. Mason

Extraction Refining

Arnold, R. C. and Lien, A. P. (assigned to Standard Oil Co.) REFINING OF HYDROCARBON OILS. U. S. 2,671,046 (1954) March 2.

The process described is broadened to include certain promoters of the Friedel-Crafts type in addition to BF_3, and is combined with a second extraction step for removal of aromatic hydrocarbons by extraction with SO_2 alone. Extraction of aromatics in the first extraction stage is reduced by addition of aromatic hydrocarbons to the SO_2 - BF_3 solvent mixture. D. M. Mason

Arnold, R. C. and Lien, A. P. (assigned to Standard Oil Co.) REFINING HYDROCARBON MATERIALS WITH SO2 AND BF3. U. S. 2,671,047 (1954) March 2.

A process for removal of sulfur compounds and decolorization of petroleum oils by means of solvent extraction with an SO_2 - BF_3 mixture is described. The process may also be applied to the refining of other hydrocarbon materials, such as coal tar fractions or distillates, shale oil, naphthalene-fractions. In the refining of shale oil fractions the process seems not only to remove organic sulfur compounds from the feed stock, but also to remove oxygen compounds and nitrogen compounds. D. M. Mason

Nato Pipe Line

NATO PIPE LINE SYSTEM PROGRESSING. *Petroleum Eng.*, 26, D10 (1954) March.

Member powers of the North American Treaty Organization have agreed upon the construction of two petroleum products lines between French ports and airfields in Northwestern Europe, which added to a pipe line now under construction, will give the NATO forces a network needed to supply the 160 airfields programmed for European defense. Routes for the planned lines, which will be located entirely in France, have not been disclosed. The routes indicated are one from Marseilles up the Rhone valley, and the other from La Havre to the east. A pipe line from St. Nazaire to Metz in Lorraine is under construction (by the U.S.) Composed of pipe ranging in diameter from 4 to 10 in. the network will consist of 1920 miles, and estimated complete costs are $100,000,000 for the three lines. Products to be handled include gasoline, jet fuel, and similar products.

H. C. Owen

Odor Removal

Brown, R. H. (assigned to Standard Oil Co.) ODOR IMPROVEMENT OF PETROLEUM OILS. U. S. 2,671,049 (1954) March 2.

The objectionable odor of distillates made from West Texas crudes, which has been found to be due to presence of saturated cyclic sulfur compounds, can be removed by contacting the sweetened oil with mercuric salts to form an oil-insoluble complex in a pasty solid form which can be removed by settling. Physical properties and analysis of effect of other treating processes on, and odor evaluation procedure for these odor bodies are described.

D. M. Mason

Residual Additives

Campbell, O. F. ADDITIVES IN RESIDUAL FUELS REDUCE ASH DEPOSITS ON STEAM-BOILER PARTS. *Oil Gas J.*, 52, 171, 172 (1954) March 22.

Additives containing magnesium oxide have been found to change the character of deposits from residual fuel ash to a dry powdery form which can be removed by soot blowers.

D. M. Mason

Shale Retorting Processes

Buell, C. K. (assigned to Phillips Petroleum Co.) PROCESS FOR DESTRUCTIVE DISTILLATION OF SOLID CARBONACEOUS MATERIALS. U. S. 2,673,177 (1954) March 23.

This invention applies fluidized system techniques to destructive distillation of carbonaceous solids, specifically oil shale. The finely divided shale, fluidized with steam or product gas, is directly contacted with a moving bed of hotrefractory pebbles. Products of distillation are withdrawn and the pebbles fall to a lower

zone where residual carbon is burned off, thus providing heat to continue the process.

E. B. Shultz

Wigton, H. F. and Lauer, B. E. OIL-SHALE RETORTING THROUGH APPLICATION OF FLUIDIZED-SOLIDS TECHNIQUES. *Chem. Eng. Progress*, 50. 134-138 (1954) March.

Details are given of a new oil shale retort which has been built to use fluidized solids techniques. The laboratory scale retort combines in a single unit a fluidized bed, internal combustion of retorted shale and heat transfer through a metallic wall separating the two zones. Shale moves upward from the vertical unit through annular preheating and retorting zones then, near the top, it spills over into a central stripping zone which feeds downward into the combustion zone. Heat liberated here is transferred radially outward through a light gauge steel wall to the annular retorting zone. Vapors are recovered at the top and spent solids at the bottom of the unit. Experiments indicated: high yields (96-101% of Fischer assay) of low viscosity oil, high thermal efficiencies and heat transfer coefficients, and large throughputs of shale (300 lb. raw shale per hour per square foot of cross-section). Due to high heat transfer rates, capacities can be larger without high wall temperatures (ranges from 920-970° F.) permitting steel rather than ceramic construction. E. B. Shultz

7. ANALYTICAL METHODS AND TESTS

Acoustic Gas Analysis

Lawley, L. E. ACOUSTIC METHODS FOR GAS ANALYSIS. *Chem. and Ind.* (British) No. 8, 200-203 (1954) February 20.

A gas analyzer employing the velocity of sound in gas for detecting change in composition is described. The instrument has been tested for several months under industrial conditions for analysis of methane in air. Date on velocity of sound indicate that the instrument could be applied to analysis of many binary gas mixtures. D. M. Mason

Arsenic Determination

Jay, R. R. and Dickson, L. R. HOW TO DETERMINE ARSENIC TRACES IN OIL OR CATALYST. *Petroleum Processing*, 9, 374-376 (1954) March.

A modification of the Gutzeit method has been developed for determination of as little as 2 to 4 parts per billion of arsenic in petroleum oil (or catalyst). The procedure includes wet ashing of the sample, reduction of the arsenic to arsine with metallic zinc, and absorption of the arsine on a filter paper impregnated with mercuric bromide to yield a yellow stain proportional to the amount of arsenic. D. M. Mason

Carbon Dioxide

Wagner, P. T. and Lew, M. CARBON DIOXIDE CONTENT OF ETHANOLAMINE SOLUTIONS. *Anal. Chem.*, 26, 575-576 (1954) March.

A titrimetric method for determining the carbon dioxide content in aqueous ethanolamine solutions is presented. The carbonate ethanolamine solution is reacted with excess sodium hydroxide and the excess base is back-titrated in a 75% ethyl alcohol solution. Probable error in the method is about ± 0.04 gram of carbon dioxide per 100 ml. of sample. E. J. Pyrcioch

Distillation Analysis

Preston, S. T. and Smith, D. E. NATURAL GASOLINE ANALYSIS. *Petroleum Refiner*, 33, 137-39 (1954) February.

An improved and rapid method is described for determination of molecular weight, vapor equivalent, and liquid to gas ratio of liquid residues from low temperature distillation analysis. D. M. Mason

Preston, S. T. and Podbielniak, W. J. LOW TEMPERATURE DISTILLATION. *Petroleum Refiner*, 33, 132-134 (1954) April.

A simplified, less expensive low temperature fractional distillation apparatus is described in which features of automatic control of distillation pressure are retained. D. M. Mason

Hydrogen Determination

Hulsberg, H. A. (assigned to Universal Oil Products Co.) HYDROGEN ANALYZER. U. S. 2,671,336; 2,671,337 (1954) March 9.

Two meters for determining H_2 in gas are de-

scribed. Determination is based on measurement of pressure (of (H_2) in a small diameter platinum or palladium tube (permeable to hydrogen at elevated temperatures) which is exposed to the gas. Means for heating the tube are provided in one of the meters.

D. M. Mason

Infrared Spectroscopy

Brown, J. K. RECENT ADVANCES IN INFRARED SPECTROSCOPY. *Brit. Coal Utiliz. Res. Assoc. Monthly*, 17, 449-464 (1953) November.

A survey article covering advances made in infra-red spectroscopy during the past seven years. Source of infrared radiation, slit systems, dispersing elements and detectors are discussed, as well as advances in amplification and recording.

P. V. Burket

Nitrogen Determination

Dombfowski, H. S. DETERMINATION OF NITROGEN CONTENT OF NOBLE GASES: ABSORPTION IN TITANIUM METAL. *Anal. Chem.*, 26, 526-28 (1954) March.

The absorption of nitrogen in titanium metal at 1000° C. and the subsequent determination of the nitrogen content of the metal by a modified macro-Kjeldahl method allows as little as a few parts per million of nitrogen to be determined in noble gases. The method may be adapted for measurement of total impurities.

D. V. Kniebes

Honma, M. and Smith, C. L. QUANTITATIVE ANALYSIS OF ORGANIC NITROGEN BY FLAME SPECTROSCOPY. Anal. Chem., 26, 458-462 (1954) March.

Quantitative analysis for nitrogen was made using a Hilger model E2 spectrograph with quartz optics and a modified Smithells-type burner. Solutions of organic compounds were sprayed into the flame which was burning on natural gas directly out of the city gas mains. A complete description of the method and discussion of the working curves, lines used, and results are given.

R. R. Amrine

McKenzie, H. A. and Wallace, H. S. THE KJELDAHL DETERMINATION OF NITROGEN: A CRITICAL STUDY OF DIGESTION CONDITIONS-TEMPERATURE, CATALYST, AND OXIDIZING AGENT. *Australian J. Chem.*, 7, 55-70 (1954) February.

By using the proper digestion conditions and mercury as a catalyst, nitrogen can be completely recovered in a reasonable time even from refractory compounds. It is difficult to get complete recovery by using hydrogen peroxide as an oxidant. A modified micro-apparatus for the distillation of ammonia and a rapid method for the determination of 0.2-2 mg of nitrogen in amino acids and proteins are described.

D. J. Dennison

Petroleum Sulfur Tests

Karr, C., Jr. EVALUATION OF TWENTY QUALITATIVE TESTS FOR PETROLEUM SULFUR COMPOUNDS. *Anal. Chem.*, 26, 528-545 (1954) March.

Fifteen different petroleum sulfur compounds in 20 different chemical reactions were examined in order to determine the value of these reactions as qualitative tests. Some of these reactions have been previously used for the detection of sulfur compounds, but at least half are believed to constitute new qualitative tests. Test procedures for aliphatic and aromatic thiols, aliphatic and aromatic disulfides, aliphatic, cyclic and aromatic sulfides, thiophenes, and condensed thiophenes are described.

Author's Abstract

Sulfur Determination

Battye, T., Johnson, R. and Wilkinson, H. C. THE USE OF BROMINE WATER IN THE DETERMINATION OF SULPHUR IN COAL OR COKE BY THE ESCHKA PROCESS. *J. Appl. Chem.* (British), 4, 119-123 (1954) March.

Data of this paper indicate that the use of bromine, with its objectionable odor and toxic properties, is unnecessary in the determination of sulfur in coal. No sulfites were formed when the fusion with Eschka mixture was carried out at 700° C. using a bunsen burner or a ventilated muffle furnace.

C. E. Hummel

8. GENERAL AND PHYSICAL CHEMISTRY

Adsorption

Zettlemoyer, A. C. and Chessick, J. J. ADSORPTION STUDIES ON METALS. III. THE SORPTION OF WATER VAPOR ON NICKEL, STEEL AND MOLYBDENUM. *J. Phys. Chem.*, 58, 242-247 (1954) March.

A monolayer of water was adsorbed on both nickel and steel surfaces at room temperatures while a polylayer of 7.9 was adsorbed on the molybdenum surface. These difficulties resulted from the formation of a loosely adhering polymolecular oxide film. Increase in the adsorption temperatures were also studied for these metals, and the results were discussed. S. Mori

Aerosol Microscopy

Kalmus, E. H. PREPARATION OF AEROSOLS FOR ELECTRON MICROSCOPY. *J. Appl. Physics*, 25, 87-89 (1954) January.

This method of preparation consists of precipitating the specimen on prepared Formvar-covered screens. Acetone is used for precipitation, filter dissolution and washing through a separatory funnel. The simple setup is described. Eight hours are required to eliminate any filter residue. S. Sensi

Gas Properties

Godridge, A. M. SOME PROPERTIES OF GAS MIXTURES. *Brit. Coal Utiliz. Res. Assoc. Monthly*, 18, 1-22 (1954) January.

A general review of the specific heat, thermal conductivity, and viscosity is presented with the emphasis on N_2, O_2, H_2, CO, CO_2, CH_4, H_2O, and air. An extensive and helpful bibliography is included. W. W. Clauson

Heat Capacity Review

Masi, J. F. SURVEY OF EXPERIMENTAL DETERMINATIONS OF HEAT CAPACITY OF TEN TECHNICALLY IMPORTANT GASES. Amer. Soc. Mech. Eng. Paper No. 53—A-206 (1953) November-December.

All of the literature reports of determinations of heat capacity of gases in the period 1925-1952, inclusive, have been reviewed, and those pertaining to any of the ten gases—air, NH_3, CO_2, CO, H_2, CH_4, NO, N_2, O_2 and H_2O—are tabulated. The four direct and six indirect methods used in these measurements are briefly described. By means of graphs, the reported results for several of the gases are compared with values calculated from molecular data and an equation of state. There is included a table of the most recent values of heat capacity at one atmosphere for the ten gases.

Author's Abstract

Low Density Behavior

Hamann, S. D. and Lambert, J. A. THE BEHAVIOR OF FLUIDS OF QUASI-SPHERICAL MOLECULES. I. GASES AT LOW DENSITIES. *Australian J. Chem.*, 7, 1-27 (1954) February.

The (28.7) type of Leonard-Jones Potential gives a good description of the properties of gases of quasi-spherical molecules. (A quasi-spherical molecule is a molecule which has a number of similar atoms symmetrically distributed over the surface of a sphere whose centre may or may not be occupied by another atom). Second and third virial coefficients have been calculated for this potential and also for $(\infty, 6)$ and $(\infty, 7)$ potential. D. C. Gami

Phase Equilibria

Donnelly, H. G. and Katz, D. L. PHASE EQUILIBRIA IN THE CARBON DIOXIDE-METHANE SYSTEM. *Ind. Eng. Chem.*, 46, 511-517 (1954) March.

Liquid-vapor equilibria for the carbon dioxide-methane system are given for temperatures from -100° F. to 29° F. and pressure up to 1250 psia. The data also includes considerable portions of the three-phase locus consisting of solid (carbon dioxide) liquid and vapor phases in equilibrium with each other. D. C. Gami

Temperature Scale

Erickson, R. A. and Roberts, L. D. THE MEASUREMENT AND THE CALCULATION OF THE LIQUID HELIUM VAPOR PRESSURE-TEMPERATURE SCALE FROM 1° to 4.2°K. *Phys. Rev.*, 93, 957-962 (1954) March 1.

Measurements between 1.2 and 4.2°K on a paramagnetic salt using a mutual inductance bridge

apparatus indicate errors in the presently accepted liquid helium temperature scale amounting to 12 millidegrees at the lamda point. These data, together with those of Kistemaker, are found to be in good agreement with a temperature scale calculated from the other thermodynamic properties of helium. The calculated scale is further confirmed by a comparison between the calculated and observed latent heat of vaporization. Accepting as correct the boiling point determination of Keesom and Clusius, the estimated accuracy of the proposed temperature scale is 1.5 millidegrees below the lambda point and 3 millidegrees above the lambda point.

Authors' Abstract

Vaporization Ratios

Vagtborg, H., Jr. EQUILIBRIUM VAPORIZATION RATIOS FOR A RESERVOIR FLUID CONTAINING A HIGH CONCENTRATION OF HYDROGEN SULFIDE. *J. Petroleum Techn.*, 6, 31-36 (1954) March.

Equilibrium vaporization ratios were obtained for light hydrocarbons, nitrogen, carbon dioxide, and hydrogen sulfide in a reservoir fluid containing 35 mole per cent hydrogen sulfide. The data cover the range from 700 to 2500 psia at 154°F. Author's Abstract

9. ORGANIC CHEMISTRY

Ethylene Recovery

Lien, A. P. and Johnson, C. E. (assigned to Standard Oil Co.) RECOVERY OF ETHYLENE. U. S. 2,670,391 (1954) February 23.

A process for the separation of ethylene from a mixture of close boiling homologs and other hydrocarbons as commonly found in refinery streams is described. The stream is contacted with an organic sulfonic acid to esterify the higher boiling olefins which are separated whereupon the remaining mixture is contacted with organic sulfonic acid-boron trifluoride complex to esterify the ethylene. Essentially pure ethylene is recovered by thermally decomposing the ethyl ester. J. M. Reid

Extractive Crystallization

Fetterly, L. C. (assigned to Shell Development Co.) SEPARATION OF HYDROCARBONS WITH THIOUREA. U. S. 2,670,344 (1954) February 23.

It is claimed that mixtures of hydrocarbons may be fractionally separated by contacting them in vapor phase with solid thiourea. Unstable molecular complexes, which are easily regenerated, are preferentially formed. This method is stated to be an improvement upon recently developed extractive crystallization processes carried out in liquid solution with urea or thiourea. Various promoters are enumerated. These greatly increase the rate of complex formation when added in small amounts to the solid thiourea. Hydrocarbons which readily form complexes, and methods for regeneration are listed and discussed.

E. B. Shultz

Truter, E. V. EXTRACTIVE CRYSTALLIZATION WITH UREA. *Chem. and Proc. Eng.*, (British) 35, 75-80 (1954) March.

The ability of urea to form crystalline complexes with many types of straight-chain aliphatic molecules offers a new and elegant method for the purification of suitable substances. In the following article the structure and properties of these urea complexes are described and the fundamental principles governing the separation of mixtures is discussed. Extractive crystallization is attractive from the engineering point of view because only simple equipment is needed for large-scale operation. The author concludes with a brief review of the applications of the process, e. g. processing of fatty acids, purification of wool grease and sperm oil, the upgrading of petrol, and the refining of jet engine fuel to lower the freezing point.

Author's Abstract

Olefin Hydrogenation

Sussman, M. V. and Potter, C. KINETICS OF PROPYLENE AND ETHYLENE HYDROGENATION. *Ind. Eng. Chem.*, 46, 457-465 (1954) March.

Investigation of the rate of hydrogenation of propylene to propane on a copper-magnesia catalyst is described. The chemical reaction and the catalyst studied are not commercially significant. The likeliest rate controlling mechanism for the hydrogenation of propylene on

a 50-50 mole % copper-magnesia catalyst, between 46° and 76°C., is the surface reaction between atomically adsorbed hydrogen and adsorbed propylene. The rate equation indicates that the reaction rate changes exponentially with temperature and linearly with hydrogen concentration. The effect of increased propylene concentration is to increase the reaction rate at low propylene concentrations and decrease it at moderate and high concentrations. Propane reduces the reaction rate. Authors' Abstract

10. CHEMICAL ENGINEERING

Conveyor Design

Lebeter, F. BELT CONVEYOR DESIGN. *Coke and Gas* (British) **16**, 107-110 (1954) March.

The belt conveyor readily lends itself to dealing with the large tonnages of coal and coke in the gas works. In this article is presented a discussion of the basic principles involved in the design of belt conveyors, and factors affecting their operation and life. S. Volchko

Dust Removal

Jewell, J. W. (assigned to The M. W. Kellogg Co.) SEPARATION OF FINELY DIVIDED SOLIDS FROM GASEOUS SUSPENSIONS THEREOF. U. S. 2,671,102 (1954) March 2.

The patent describes several types of separating equipment for the removal of fluid catalysts from off-gas streams. W. G. Bair

Equipment Costs

EQUIPMENT COSTS STILL GOING UP. *Chem. Eng.*, **61**, 214-215 (1954) March.

Annual average indexes of comparative equipment cost for eight process industries and four related industries from 1913 through 1953 are presented in tabular and graphical form. The Austin industrial building cost index and the Engineering News-Record construction cost index are included in the graphical presentation. E. J. Pyrcioch

Gas Heater

Stone, H. N. (assigned to Norton Co.) GAS HEATER. U. S. 2,670,425 (1954) February 23.

A gas heating apparatus is illustrated comprising of two refractory lined fluidizing chambers, one containing an electrical heating means, both containing a quantity of fine particles of refractory (24 to 600 grit size) material which may be an oxide, carbide, silicide, nitride, boride or a mixture of compounds depending upon which are poisonous to whatever reaction is to take place. In this process an inert or non-oxidizing gas is passed through the first chamber whereby it is heated and recycled through the recuperator whereby the heat units are transfered and the gas to be heated is then passed through the recuperator where it is heated to an intermediate temperature, then through the heater, then through the second fluidizing chamber and finally the fully heated gas is then exhausted through a refractory pipe to any apparatus for any further process of conversion. S. Volchko

Stone, H. N. (assigned to Norton Company) GAS HEATER. U. S. 2,670,426 (1954) February 23.

A gas heating apparatus is illustrated comprising of a electrical-resistant-heated, refractory-lined fluidizing chamber containing a quantity of silicon carbide or alumina particles (24 to 600 grit size) whereby when gas is forced through the chamber at sufficient velocity some of the particles will fluidize and heat transfer from this source to the gas will be accelerated. S. Volchko

Heat Exchangers

Gilmour, C. H. SHORT-CUT TO HEAT EXCHANGER DESIGN—VI. *Chem. Eng.*, **61**, 209-213 (1954) March.

Short-cut design equations and computation sheets are given for rating vertical vapor-in-tube, cross-flow-in-shell heat exchangers for condensing gas-vapor mixtures. Mechanisms of cooling and condensation as well as development of the design equations have been discussed under the following assumptions: 1) the gas-vapor mixture is cooled to a fictitious mean temperature which is obtained from a plot of mean temperature against percent total heat load; 2) condensation takes place at the mean temperature so obtained; 3) the uncondensed portion is cooled in the gas phase from the mean temperature to the outlet temperature; and 4) the condensate is cooled in the

liquid phase throughout the same temperature range. This is the sixth article of a series.

S. Hu

Pipe System Design

Brock, J. E. FLEXIBILITY OF PIPING SYSTEMS SUPPORTED BY EQUALLY SPACED RIGID HANGERS. *J. Appl. Mech.*, 21, 11-18 (1954) March.

Exact mathematical methods are developed for the analysis of single-plane piping configurations containing long horizontal runs supported by equally spaced rigid hangers. The cases of the V-bend and the off-set are fully detailed and used as examples. G. V. Vosseller

Plant Wastes

Edmonds, R. G. and Jenkins, G. F. RECOVERY OF PHENOLICS FROM WASTE EFFLUENTS. *Chem. Eng. Progress*, 50, 111-115 (1954) March.

A counter-current extractive method is discussed, which uses isopropyl ether to extract emulsified immiscible oils, soluble nitrogen bases and dissolved oxygenated compounds, such as phenol, from a water layer. The process can reduce the phenol content of the water layer to 0.095%, and it shows promise as a method of controlling plant waste effluents.

G. V. Vosseller

Pulverization

Riley, R. V. SIZE REDUCTION. *Chem. and Process Eng.* (British) 35, 81-84 (1954) March.

A review of recent literature on size reduction is presented with emphasis on advances and improvements in comminuting equipment. Articles dealing with the theory of grinding and milling are cited. The crushing and grinding of coal, clay, rocks and ores, and chemicals is discussed. An extensive list of references is included. E. J. Pyrcioch

Walker, D. R. and Shaw, M. C. A PHYSICAL EXPLANATION OF THE EMPIRICAL LAWS OF COMMINUTION. *Mining Eng.*, 6, 313-320 (1954) March.

The energy requirement for comminution is examined in terms of particle size when applied to metal cutting theory. Data on fine grinding operations (particles of 1.0 micron and less) support Kick's law based on a critical strain energy concept. Rittinger's law, based on the prediction that the energy for crushing is proportional to the new surface generated, apparently holds for particles larger than 1.0 micron only when the range of particle size involved is small. Data are shown in graphical form for the specific energy requirement per unit volume of particles as a function of particle size for machine shop grinding, milling and turning operations.

C. G. von Fredersdorff

Reactors

Garbo, P. W. (assigned to Hydrocarbon Research, Inc.) HYDROCARBON SYNTHESIS AND APPARATUS THEREFOR. U. S. 2,671, 796 (1954) March 9.

Apparatus for a fluidized reactor that recycles the process gas stream within the reactor shell.

G. V. Vosseller

McClure, W. L. (assigned to Sun Oil Co.) APPARATUS AND METHOD FOR CONTACTING SOLIDS WITH GASES. U. S. 2,671,057 (1954) March 2.

A fluid catalyst reactor is described which embodies a system of conical gas inlets and baffles to assume more even contact of vapor and catalyst to gain more efficiency. W. G. Bair

McIntire, R. L. (assigned to Phillips Petroleum Co.) PEBBLE HEATER. U. S. 2,673,791 (1954) March 30.

A pebble heater design for the pyrolysis of gaseous reactants which evenly distributes reactants throughout the conversion chamber.

G. V. Vosseller

Refinery Computations

Orr, F. M. PUT THE AUTOMATIC COMPUTER TO WORK. *Oil Gas J.*, 52, 87, 88, 90 (1954) March 1.

The automatic digital computer can be used to advantage in a number of refinery applications, such as: 1) work-up of test data from plant and pilot plants, 2) calculation of plate-

to-plate multicomponent distillation problems, 3) economic studies such as proper processing schemes for new stocks, 4) calculation of mass-spectrometer analyses, and 5) yield and quality calculations on various process units. A considerable savings in manpower is achieved, and the data are reduced to useable form in greatly reduced time. Rigorous calculation of orifice meter coefficients by the computer is also discussed. B. E. Eakin

Scrubber

Schellenburg, E. (assigned to Koppers Co.) GAS SCRUBBER PROVIDED WITH ROTARY SPRAYING DEVICE AND INDICATOR. U. S. 2,671,651 (1954) March 9.

This invention embodies a gas scrubber having a washing-liquid inlet at the top and a rotary spraying device operable in the manner of a water-wheel arranged inside of the top of the scrubber for rotatable propulsion by the entering washing liquid. The axle of the spraying device is enclosed in a housing to protect the ball-bearing from coming into contact with and being attacked by the corrosive washing liquid that might leak out from the liquid inlet. S. Hu

Solvent Hazards

Croswell, V. R. SAFETY. *Ind. Eng. Chem.*, 46, 117-A-118 (1954) March.

Adequate ventilation is the answer to the health and fire hazard problems resulting from the increasing use of solvents in industry. E. Mann

Storage Tank Design

Williams, F. PRE-STRESSED CONCRETE HOLDER TANK. *Gas J.* (British) 277, 477-479, 482 (1954) February 24.

The use of pre-stressed concrete represents an innovation in gas holder tank construction and is probably more costly from the standpoint of installation time and leakage difficulties, although some saving in steel is effected. C. G. von Fredersdorff

Gray, R. T., Boothe, W. and Horvay, G. STRESSES IN CYLINDRICAL PRESSURE VESSELS PARTIALLY SUPPORTED BY SOIL. Amer. Soc. Mech. Eng. Paper No. 53—A-82 (1953) November-December.

Curves are plotted which indicate the reduction in bending stresses that can be achieved near a discontinuity in a cylindrical shell by application of partial elastic support in the vicinity of the discontinuity. Authors' Abstract

11. PROCESS EQUIPMENT AND INSTRUMENTATION

Industrial Photography

Waddell, J. H. and Waddell, J. W. PHOTOGRAPHIC MOTION ANALYSIS. SECOND PART. *Ind. Sci. and Eng.*, 1, 27-34 (1954) March.

This is the second of an exclusive series by the Waddells in which they continue a review of facts and techniques in industrial photography and which will be published later in book form. Authors' Abstract

Orifice Meters

Baird, R. C. EFFECT OF GAS PULSATION ON ORIFICE METER MEASUREMENT. *Gas*, 30, 120, 122, 124, 126 (1954) March.

This is a sequel to another article on the subject in which was presented the concept of impedance mismatch caused by an orifice plate in a pipe, and the consequences arising therefrom. It was pointed out that perhaps the major effects caused by impedance mismatch are a change of intensity of a pulsation wave propagating through the orifice and a change in phase of this wave at the orifice. These two effects are principally functions of orifice beta ratio, frequency of the pulsation wave, and, to a lesser extent, the flow rate. Pressure, temperature, gas density and viscosity are influencing parameters, but their effects will not be considered here. This treatise is limited to a showing of the mathematical methods for calculating orifice metering error. In particular, it will be shown how the presence of pulsation causes an error in orifice differential pressure which in the case of a complex wave cannot be satisfactorily determined at the present time because of insufficient empirical data. It is assumed, as in the first study, that the inferen-

tial-type recording meter reads accurately the actual pressure differential occurring at the orifice taps. (The first study provides background for the procedures discussed here. *ASME Trans.*, 74, 1381 (1952) Nov.)

Author's Abstract

Pressure Relief

Holinger, C. J. SAFETY DISKS. *Instruments and Automation*, 27, 452-54 (1954) March.

A complete program is presented which enables the user to make pressure relief safety disks by proper choice of material and by constructing the disks in accordance with a few simple calculations and adequate proof tests.

S. Volchko

Surface Roughness

Hallendorf, C. J. DEVICE FOR MEASURING ROUGHNESS OF SURFACES. U. S. 2,672,049 (1954) March 16.

The device described presents some technical modifications, without changing any basic idea of existing devices for measuring roughness of surfaces. A plurality of sharply pointed needles (instead of one or two) arranged side by side and guided for individual displacement perpendicularly to a surface to be tested, will give, through simultaneous indicating means, a scale of the least penetrations into the surface as well as of the deepest ones, thus showing the differences in height between the two planes. No check for the accuracy of the measurements, nor the "relative" resolution power of the system are mentioned.

S. Sensi

Steam Traps

Oliver, K. G. STEAM TRAPPING. *Instr. and Autom.*, 27, 470-473 (1954) March.

General review of the various types of steam traps, how they operate and limitations in use. Also gives information on selection of the proper type and size of trap for various loads and services.

G. V. Vosseller

Strain Gage

Meyerson, N. L. STRAIN GAGE: PROMISING TOOL FOR THE GAS PIPELINE INDUSTRY. *Gas*, 30, 128-130, 132 (1954) March.

An explanation of the strain gage, methods of application and limitations in use. Some useful applications for the gas industry are presented.

G. V. Vosseller

Transductors

Derr, W. A. and Cham, E. J. TRANSDUCTORS FOR INSTRUMENTATION OF D-C CIRCUITS. *Westinghouse Eng.*, 14, 86-89 (1954) March.

The article describes a new device, the Magamp transductor, which can be made to serve, in effect, as a d-c transformer. Such transductors are suitable for potential, current, and power measurement circuits; they can also be used for such applications as totalizing current, or in telemetering circuits. A transductor is a magnetic amplifier of simple saturable-reactor type: basically it consists of a pair of two-winding transformers. The input windings of the two transformers are connected in series opposition so that the fundamental component of the a-c input is cancelled in the d-c windings, thus nullifying any unwanted transformer action.

J. G. Chalcraft

12. MATERIALS OF CONSTRUCTION

Corrosion Control

Dirks, R. W. CORROSION INHIBITOR IN A GAS-CONDENSATE FIELD. *Oil Gas J.*, 52, 92-93 (1954) March 1.

The use of an organic-type corrosion inhibitor (Kontol 110, 115, 118, 224) on gas wells in the West Tuleta field, Bee County, Texas, for 7½ years clearly confirms the benefits to be derived from the continuous use of properly selected and applied inhibitors. Prior to injection of the inhibitor, tubing failures occurred at the rate of one per every 1,700 MMCF of gas produced; since the treating program began, approximately 50,000 MMCF of gas have been produced without a tubing failure and the iron content of the produced water has been reduced from about 300 ppm to about 26 ppm. Once a protective film has been established on the tubing and surface fittings, only a small amount of the inhibitor is necessary to maintain excel-

lent protection; e.g., on one well 1 qt. of inhibitor per 28 MMCF of gas is now used. The inhibitor is easily applied by batch treating using lubricators with a resulting very low cost of treatment. Gathering lines have also been protected without additional inhibitor being added. The gas produced is typical of the Wilcox formation in this area, containing 2.19 per cent carbon dioxide and water at the rate of 2 bbl. per MMCF of gas. The water is fresh and contains 199 ppm. total solids.

H. C. Owen

Mudd, O. C. NEW TECHNIQUES AND CURRENT PROBLEMS IN CONTROL OF UNDERGROUND CORROSION. *Gas Age*, 112, 46-51, 77, 78 (1953) December 17.

Effectiveness of corrosion control measures can be improved by modification of present techniques that give better results from materials and energy presently used in mitigation measures. The article gives construction features, accessory equipment, and coating requirements.

B. E. Eakin

Pipeline Plugging

Brauer, M., Jersey City, N. J. APPARATUS FOR PLUGGING HOLES IN PIPE LINES. U. S. 2,672,161, 2,672,162 (1954) March 16.

These inventions relate to apparatuses for plugging holes in pipe lines, and more particularly to the repairing of boiler tubes, chemical pipe conduits and high temperature and/or high pressure conduits. Permanent repairs of punctured pipe lines are possible with the use of these apparatuses.

S. Volchko

Plastic Gas Mains

Webber, C. H. AN OPERATING MAN LOOKS AT PLASTIC TUBING FOR GAS MAINS. *Gas*, 30, 44-46 (1954) February.

The use of plastic gas mains has been initiated on an experimental, semi-practical basis by Tucson, Ariz. and several other systems. Plastics with the ability to withstand corrosion, impact, and abuse, to form homogenous, bonded connections, and to expand or contract with changes in ground temperatures have demonstrated their suitability for the construction of our underground systems.

A. J. Tulis

Reactor Linings

Bradbury, W. A. MONOLITHIC LININGS FOR REFINERY SERVICE. *Petroleum Refiner*, 33, 167-172 (1954) March.

Data and information are presented as developed from experimental work and field installations of monolithic linings in vessels and lines handling hydrocarbons and catalyst at high temperatures. The lining which has been developed for carbon steel vessels consists of an inner layer of refractory concrete reinforced with carbon steel floor steel, an intermediate layer of insulating concrete reinforced with wire mesh, and a cement and sand layer (1:3 mix) reinforced with wire mesh adjacent to the shell. Tests have shown the lining to have good insulating characteristics and to be effective in preventing erosion and corrosion of the steel shell. Low initial and maintenance costs are claimed for this type of lining.

E. J. Pyrcioch

Weld Inspection

Stewart, P. J. INSPECTING PIPELINE WELDS BY RADIOACTIVE ISOTOPES. *Gas*, 30, 118, 119 (1954) March.

The U. S. plants at Oak Ridge and Brookhaven, and a Canadian firm, now prepare radioactive materials in nuclear reactors which can be exploited for inspecting pipeline welds. A form of radioactive iridium (192) can be safely handled for its low energy gamma ray and gives high sensitivity and contrast in radiographic film. Two types of cameras can be operated: one can take up to 220° of the welding seam in a single exposure, the other gives a full 360° coverage of the weld. The operation of these radioactive isotopes is considered a major step for the problems of detecting corroded areas, scale, fittings and cracks in oil and gas pipelines.

S. Sensi

The following articles, the abstracts for which appear on the pages indicated, are also called to your attention:

Biert, J. SLAG DEPOSITION AND CORROSION IN GAS TURBINE. p. 99

Williams, F. PRE-STRESSED CONCRETE TANK. p. 114

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